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NOTES ON GEOGRAPHIC DISTRIBUTION

First record of the diving beetle *Ilybius pseudoneglectus* (Franciscolo, 1972) in Slovakia (Coleoptera, Dytiscidae)

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Abstract. We present the first records of the diving beetle *Ilybius pseudoneglectus* (Franciscolo, 1972) from Slovakia. This species is described from Italy and Croatia and is distributed mainly along the Adriatic coast south through Montenegro to Greece. The Slovak specimens come from a flooded inland salt marsh and salt meadow biotope in a lowland near the village of Tvrdošovce (southwestern Slovakia). *Laccornis kocae* Ganglbauer, 1904, *Helophorus micans* Faldermann, 1835, and *Helochares lividus* (Forster, 1771) shared the same microhabitat and are other rare beetles of lowland wetlands.

Key words. Central Europe, distributional range, faunistic, identification, water beetles

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INTRODUCTION

Slovakia has a long tradition of beetle research and, concerning aquatic beetles, Kodada et al. (2003) have published a comprehensive checklist based on verified records in museum and private collections. During a new research program to obtain DNA samples of Dryopidae, Elmidae, and Byrrhidae, we visited three inland salt marshes and salt meadows in Slovakia that belong to priority biotopes of European importance. All of them are in a lowland with very fertile soils, and local agriculture intensively uses all surrounding areas. The quality of these biotopes usually affects improper management, and thus, the salt pans have become overgrown by vegetation and are in a terminal state of succession. Where human activities disturb vegetation cover and a thin layer of soil, the salt marshes are in good condition and visible. BROZ, a leading non-governmental organization in ecosystem conservation and restoration in Slovakia, restored grazing in salt marshes to improve the structure of the habitat. Generally, salt marsh biotopes in Slovakia are fragmented, small, and confined to terrain depressions characterized by almost annual spring flooding caused by precipitation events, which is already common at the end of winter. In spring and summer, these periodic waters disappear, the salt flats show a significantly hardened soil horizon, and minerals precipitate from the water. On the salt marsh near the village of Tvrdošovce in southwestern Slovakia, we sampled the first Slovakian specimens of *Ilybius pseudoneglectus* (Franciscolo, 1972). This record represents the northernmost occurrence of the species published to date.

METHODS

We used a D-frame hand net to collect water beetles and applied a multihabitat scheme to sample significant habitats proportionally according to their presence within a sampling reach. After several replications, we rinsed the collected material twice or three times with water and sorted the specimens directly in the field.

In the laboratory, we extracted male genitalia from relaxed specimens, cleared them in lactic acid for two days, and temporarily mounted them on a microscope slide with a single cavity in Berlese fluid. After examination, we mounted the male genitals in a drop of DMHF on the same card as the respective specimen.

We examined specimens using a Leica M205C stereomicroscope with fusion optics and diffuse lighting at magnifications up to 160×. For the habitus photograph, we used a Zeiss Axio-Zoom.V-16 stereomicroscope, diffuse LED lighting, a Canon 5D Mark IV camera, and a ZereneStacker software (https://zerenesystems.com/cms/stacker).

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For identifying species of *Agabus* Leach, 1817 and *Ilybius* Erichson, 1832, we used the publications of Nilsson (2000), Fery and Nilsson (1993), Fery and Hendrich (2011), and comparative material of the *Ilybius chalconatus* (Panzer, 1796) species group deposited in the Naturhistorisches Museum (**NMW**), Wien, Austria.

One voucher specimen of *Ilybius pseudoneglectus* is stored in the Dytiscidae collection of the NMW; two other specimens and all remaining species sampled are in the collection of Kodada (**CKB**) in the Department of Zoology, Faculty of Natural Sciences, Comenius University in Bratislava, Slovakia.

The distribution map was created in QGIS v. 3.30 software and edited in Adobe Illustrator 2024. It includes published data from Ferry and Nilsson (1993), Hájek and Csabai (2009), Štastný (2009), Fery and Hendrich (2011), as well as 14 records in the distributional data from 2015–2017 provided by Boda et al. (2022) accessed via GBIF.

RESULTS

***Ilybius pseudoneglectus* (Franciscolo, 1972)**

Agabus pseudoneglectus Franciscolo, 1972: 84. Type locality: Stagno La Bugna, S. Giacomo Minore, Guastalla, Province di Reggio Emilia, Italy.

Agabus skianthos Hinterseher, 1981: 87. Synonymised by Fery and Nilson (1993). Type locality: Insel Skianthos, Nördliche Sporaden in Griechenlad, Greece.

First records. SLOVAKIA – Nitriansky kraj (Nitra region) • Tvrdošovce village environment; 48°06′01.62″N, 018°02′01.15″E; alt. 110 m; 15.iii.2024; J. Kodada leg.; 1 ♂, NMW IPS 471 • Tvrdošovce village environment; 48°05′55.89″N, 018°02′01.52″E; alt. 110 m; 8.iv.2024; J. Kodada and D. Selnekovič leg.; 2 ♂, CKB IPS 472-3.

Identification. *Ilybius pseudoneglectus* belongs to the *I. chalconatus* species group, containing 16 species mainly from the Western Palaearctic (Fery and Nilsson 1993, Fery and Henrich 2011). Nilsson (2000) transferred these species to the genus *Ilybius* from *Agabus* and set new morphological limits for the genera *Agabus*, *Ilybius*, and *Platambus* Thomson, 1859. In his revised key to the *Agabus* group of genera, *Ilybius* is characterized by the medially broadly interrupted linear fovea on the clypeus and the pronotum with continuous fine line along the anterior margin. He listed three autapomorphies for *Ilybius*: female ovipositor with lateral ridge, pronotum with fine anterior bead continuous, and metacoxal lines reduced anteriorad.

Fery and Nilsson (1993) classified *I. pseudoneglectus* (Figure 1A) within the *I. montanus* subgroup, comprising five Western Palaearctic species from Great Britain to Asia Minor and the Caucasus. The most important diagnostic features of the species of this subgroup are the male genitalia, which have characteristic shapes and setation of parameres and a form of the median lobe. Female genitalia are not helpful for a clear separation of species. Fery and Henrich (2011) revised the identification key and added a sixth species to the *I. montanus* subgroup, *I. enpalaiatheca* Fery & Hendrich, 2011 from Turkey.

The following characters are suggested for the identification of *I. pseudoneglectus* (Fery and Nilsson 1993; Fery and Henrich 2011). The body length is 7.7–8.8 mm, and the antennae are apically infuscate. The metasternal wings are of medium width. The male sternum seven sublaterally bears short rugae in the apical third. The protarsal claws have ventral margins weakly sinuate. The anterior metatarsal claws are slightly more strongly curved subapically than the posterior claws. The paramere (Figure 1B) has a narrow distal portion without long setae; the ventral setation is confined to the medial third; the proximal portion of the paramere is relatively broad with oblique striation. The median lobe (Figure 1C) has the distal part long and narrow, almost flat in lateral view, and the dorsal groove is broad subapically, without constriction.

Co-occurring species. *Helophorus micans* Faldermann, 1835, *H. aequalis* Thomson, 1868, and *Helochares lividus* (Forster, 1771) shared the same habitat during the first sampling in March. *Agabus uliginosus* (Linnaeus, 1776), *Liopterus haemorrhoidalis* (Fabricius, 1787), *Laccornis kocae* Ganglbauer, 1904, *Hydroporus planus* (Fabricius, 1781), and *Rhantus suturalis* (Macleay, 1825) were the additional species sampled in April on the salt marsh near the village of Tvrdošovce in southwestern Slovakia (Figure 2A).

Distribution. Albania, Bulgaria, Croatia, Greece, Hungary, Montenegro, Romania, and Slovakia (Figure 2B).

DISCUSSION

The type locality of *Ilybius pseudoneglectus* is in Italy, and most distributional record come from regions along the Adriatic coast from Italy and Croatia through Montenegro to Greece, including several records from Adriatic islands (Corfu, Zakinthos) and the Peloponnese (Fery and Nilsson 1993; Hájek 2017). However, detailed habitat preferences or ecological data are not available for these records.

Štastný (2009) added an inland record based on a male specimen collected in the Bihor Mountains of western Romania. The specimen inhabited a small, deep-shaded mountain lake with a narrow littoral zone sparsely vegetated by *Carex* sp., very steep banks, and a muddy bottom.

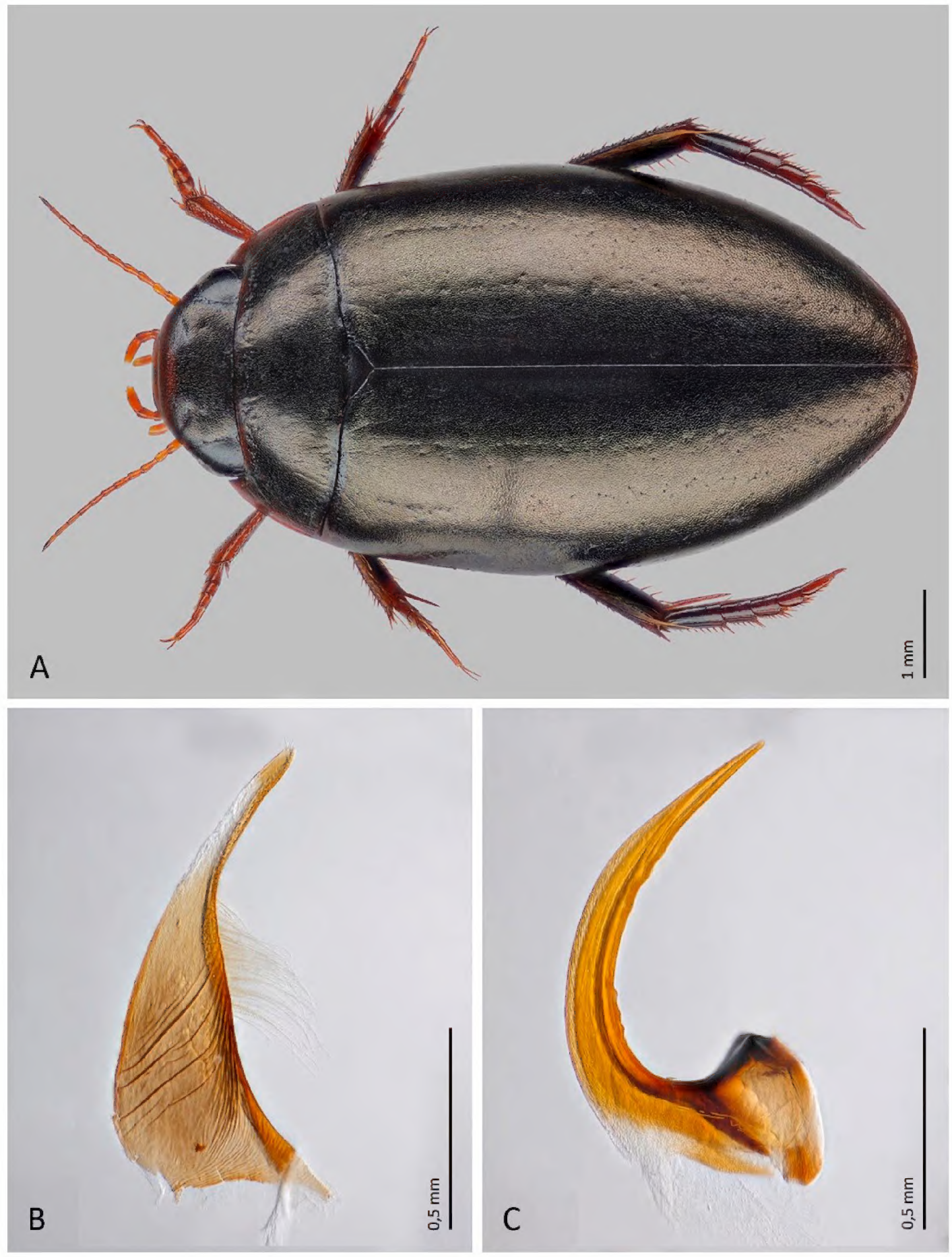

Figure 1. *Ilybius pseudoneglectus*, male. **A.** Habitus, dorsal view. **B.** Paramere, lateral view. **C.** Median lobe, lateral view.

Addition inland records were provided by Hájek and Csabai (2009), who published the first Hungarian records based on two males collected from the Hortobágy Puszta and Apajpuszta. These specimens come from salt-steppe pools, and this is the first time that this species' preference for alkaline wetlands was indicated.

Boda et al. (2019, 2022) complemented the Hungarian geographic distribution of *I. pseudoneglectus* by sampling the saline Puszta plains in the Körös-Maros National Park in southeastern Hungary. Their research included 55 localities in two saline plains, Kardoskút Puszta and Csanád Puszta. The sampled Pannonic salt marshes and soda pans are among the most vulnerable European aquatic habitats, and these unique habitats are classified as wetlands of international importance and designated under the Ramsar Convention. Soda pans are specific inland saltwater bodies dominated by sodium carbonate and hydrogen carbonate ions. This ion composition generally results in lower salinity than sodium chloride and sulphate salt lakes, favouring more wildlife and higher biodiversity. They sampled 13,268 specimens and identified 228 aquatic macroinvertebrate taxa, including 104 coleopteran species. So, the newest data show a clear preference for Pannonian salt steppes for *I. pseudoneglectus*.

Male specimens from the salt marsh near the village of Tvrdošovce in Slovakia were captured about 170 km from Apajpuszta and 370 km from Hortobágy puszta, the nearest Hungarian localities. So far, the locality represents the northernmost occurrence of the species, and this is Slovakia's first record. Habitat preferences correspond well with those from Hungary. We are unsure if a stable population exists in Slovakia. One of Europe's most extensive sets of inland soda pans and 99% of the total surfaces of Pannonian salt steppes

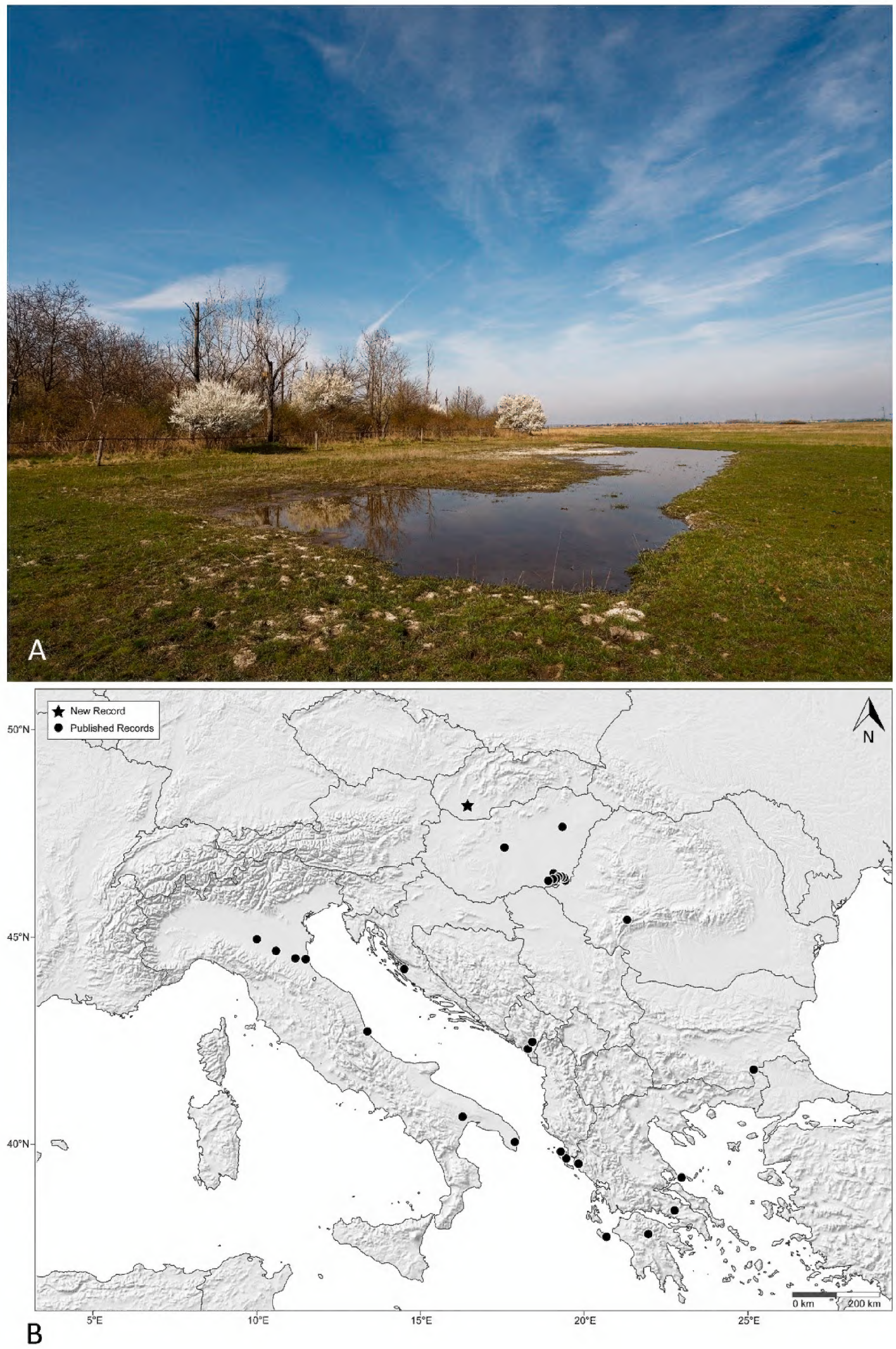

Figure 2. A. The salt marsh near Tvrdošovce. **B.** Distribution of *Ilybius pseudoneglectus*.

with salt marshes are in Hungary (Boda et al. 2019). Similar saline habitats were thoroughly destroyed or cultivated in Slovakia in the past for agricultural purposes, and only fragments of these biotopes still exist. Unstable water balance, small size, climate change, and human activities threaten these biotopes. The distribution of *I. pseudoneglectus* in other habitats will probably be minimal in Slovakia because recent mapping of the endangered *Graphoderus bilineatus* (De Geer, 1774) in many standing water bodies has not detected this species. However, it is alarming how species diversity has decreased in most biotopes.

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ADDITIONAL INFORMATION

Conflict of interest
The authors declare that no competing interests exist.

Ethical statement
No ethical statement is reported.

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Conceptualization: JK. Funding acquisition: JK, KG. Project administration: JK, KG. Visualization: JK, DS. Writing – original draft: JK. Writing – review and editing: JK, DS, KG.

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Data availability
All data supporting this study's findings are available in the main text.

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